Wetland Observations

Adapted from: "Run for the Border" and "Do You Dig Wetland Soil" in WOW! Wonders of Wetlands: An Educator's Guide. Bozeman: The Watercourse and Environmental Concern, Inc., 1995.

Grade Level: Intermediate to Advanced

Duration: 1.5 hours

Setting: Wetland field site

Summary: Students visit a wetland and make observations to determine if the area is a wetland, what type of wetland it is, and where the wetland boundaries are.

Objectives: Students will be able to:
- -Define "wetland" and describe the three main characteristics of a wetland;
- -List and describe the characteristics of the four major types of wetlands;
- -Identify a wetland and the type of wetland in the field;
- -Locate the approximate boundaries of a wetland in the field.

Vocabulary: wetlands, surface water, runoff, hydrology, hydric, hydrophytic, anaerobic, emergent, floating leaved, submergent, Wetland Indicator Status, obligate wetland, facultative wetland, facultative, facultative upland, obligate upland, marsh, swamp, bog, fen, peat, sedge

Related Module Resources:
- Fact Sheets:
  - -"An Introduction to Wetlands"
  - -"Wetlands Overview"
  - -"Types of Wetlands"
  - Wetlands books

Materials (Included in Module):
- 3 auger soil samplers [Box B]
- 1 soil logging tray [Box B]
- 5 aluminum trays [Box B]
- 5 rulers [Wetland Observations Activity Envelope]
- 5 laminated soil color charts [Wetland Observations Activity Envelope]
- 5 yard sticks [Box B]
- Wetland Observations Data Sheet
- Wetlands Summary Handout
- Soil Color Chart master
- *Soil Survey of Crawford County Pennsylvania*
- *Abridged National List of Plant Species that Occur in Wetlands*

Additional Materials (NOT Included in Module):
- clipboards

ACADEMIC STANDARDS:

7th Grade
4.1.7.D. Explain and describe characteristics of a wetland.
- Identify specific characteristics of wetland plants and soils.
- Recognize the common types of plants and animals.
- Describe different types of wetlands.

4.1.7.E. Describe the impact of watersheds and wetlands on people.
- Explain the influence of flooding on wetlands.

10th Grade
4.1.10.D. Describe the multiple functions of wetlands.
- Analyze wetlands through their indicators (e. g., soils, plants, hydrology).

4.1.10.E. Identify and describe natural and human events on watersheds and wetlands.
- Describe how natural events affect a watershed (e. g., drought, floods).
- Identify the effects of humans and human events on watersheds.

12th Grade
4.1.12.D. Analyze the complex and diverse ecosystems of wetlands.
- Describe and analyze different types of wetlands.

BACKGROUND:

In recent years, the word "wetland" has come to be used more and more frequently. We hear about wetlands on the radio and news and we read about them in the newspaper. Wetlands have always been with us but as we learn more about them, we realize how important they are ecologically and socioeconomically. *(Note: Wetland functions are discussed extensively in the module activity, "Wetland Metaphors".)* So, what is a wetland anyway and how do we identify wetlands?

What is a wetland?

According to Chapter 105 of the Pennsylvania Code, **wetlands** are defined as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." That is, wetlands are areas where the soil is wet most or all of the time and that support different types of life that are adapted to such saturated soil conditions. Other names for specific types of wetlands include marshes, swamps, bogs, and fens.

Wetlands are often the margins between the dry uplands and bodies of water such as lakes, streams,

ponds, and oceans. The "wet" in "wetland" comes from **surface water** and/or groundwater that discharges (flows out of the ground) into the wetland. Surface water includes precipitation that falls directly into the wetland as well as precipitation that flows over the land (called **runoff**) and into the wetland.

How do we identify wetlands?

As indicated by the Pennsylvania code definition above, we can recognize wetlands by the presence of water, or **hydrology** of an area, by saturated or **hydric** soils, and by vegetation that is adapted to saturated conditions, also called **hydrophytic** vegetation. Wetlands are bounded by uplands, waterways, or both. The hydrology, soils, and vegetation of wetlands differ from the hydrology, soils, and vegetation of the uplands; therefore, by looking for changes in these three factors, we can locate the upland boundaries of wetlands. Wetland-waterway boundaries are more obvious and easier to locate.

Hydrologically, wetlands are saturated at least periodically, if not constantly. In contrast, uplands typically only have standing water after heavy rain events or snow melts. The presence of standing water is a good indication of wetland conditions.

Because of wetland hydrology, hydric (saturated) wetland soils differ from upland soils. Hydric soils are saturated most of this time. This saturation can lead to **anaerobic** (low or no-oxygen) conditions in the upper layers of the soil. Under these anaerobic conditions, chemical reactions take place which alter the color of the soil. Hydric soils can be described as organic or mineral. Organic hydric soils contain partially decomposed plant matter and are typically black or very dark brown. Mineral hydric soils contain sand, silt, and clay but contain no plant matter. Mineral hydric soils that are saturated all the time develop a gray, blue-gray, or green hue. Mineral hydric soils that go through saturated as well as dry periods usually have a mottled appearance and brown, red, orange, yellow, or black spots. Finally, hydric soils are typically slippery and have the tendency to ooze. By examining the texture and color of soils, we can identify them as hydric wetland soils or upland soils. A useful resource to help determine the type(s) of soil at a given location is a soil survey. A copy of the *Soil Survey of Crawford County Pennsylvania* is included in the module for your reference.

Just as wetland soils differ from upland soils, wetland vegetation and upland vegetation differ significantly. As described above, wetland vegetation is characteristically hydrophytic, or adapted to saturated conditions. Some common hydrophytic vegetation that students are likely to find in wetlands includes cattails, arrowhead, bulrushes, blueberries and cranberries, sphagnum moss, willow trees, sedges, grasses, birch trees, and shrubs. Many hydrophytic plants are **emergent**, meaning that part of the plant emerges above the surface of the water. Others are **floating leaved** and, as their name indicates, their leaves float on the surface of the water. **Submergent** plants are completely submerged or underwater. (For more specific information on wetland plants, see the module activity "This Plant Key is All Wet" and/or the numerous books about wetland vegetation included in the module.)

Another way to categorize wetland plants is by their **Wetland Indicator Status**, or the "probability of encountering the plant in terms of frequency of occurrence (%) in wetland (vs. nonwetland) habitats" (*Abridged National List of Plant Species that Occur in Wetlands*—a copy of this document is included in the module). There are five different categories of Wetland Indicator Status according to the Pennsylvania Department of Environmental Protection:

Obligate Wetland (OBL) = "Occur almost always (estimated probability >99%) under natural conditions in wetlands."
Facultative Wetland (FACW) = "Usually occur in wetlands (estimated probability 67%-99%), but occasionally found in nonwetlands."
Facultative (FAC) = "Equally likely to occur in wetlands or nonwetlands (estimated probability 34%-66%)."
Facultative Upland (FACU) = "Usually occur in nonwetlands (estimated probably 67%-99%), but occasionally found in wetlands (estimated probability 1%-33%)."
Obligate Upland (UPL) = "Occur in wetlands in another region, but occur almost always (estimated probably >99%) under natural conditions in nonwetlands."

If obligate wetland plants are present in an area, that is an excellent indication that the area is indeed a wetland. Areas with mostly facultative upland and obligate upland plants are almost surely nonwetland areas. It is more difficult to determine if areas with facultative wetland and facultative plants, in the absence of facultative upland, obligate wetland, or obligate upland, are wetland or nonwetland areas. In these cases, one must rely more heavily on the soils and hydrology of the area to make a determination. Other indicators of wetland habitat are black stains on leaves, indicating that the vegetation had been exposed to submerged, anaerobic conditions, and fluted trunks, such as those typical of bald cypress trees.

Once we've identified an area as a wetland based on its hydrology, hydric soils and hydrophytic vegetation, we can make more observations to determine the specific type of wetland. Variations in hydrology and the types of hydric soils and hydrophytic vegetation, coupled with variations in climate, landscape, and human impact, result in numerous kinds of wetlands. The four main types of wetlands are marshes, swamps, bogs, and fens.

Marshes are found along or near waterways and are fed by flooding, surface water and groundwater. Marshes are saturated or have standing water (up to seven feet deep) during part of the year but can completely dry up in the summer or during drought periods. Marshes support mostly non-woody, soft-stemmed vegetation such as cattails and bulrushes.

Swamps are also found along or near waterways but are fed mostly by surface water. Like marshes, swamps are saturated or have standing water during part of the year but can completely dry up in the summer or during drought periods. The standing water in swamps, however, is usually shallower than the standing water in marshes. Unlike marshes, swamps support mostly woody-stemmed vegetation such as trees and shrubs.

Bogs, which form in depressions carved out by glaciers, are found in northern areas and are fed only by rainwater. Bogs are filled with stagnant, acidic water and rarely dry up because they have no way to drain. The acidic water cannot support much life but bogs are often covered with sphagnum moss, out of which evergreen trees and shrubs can grow. Another characteristic of bogs is that they contain large deposits of **peat** (layers of dead plant material). The peat material decomposes very slowly because the bog water is so acidic and low in oxygen.

Fens are also found in northern glaciated areas and form peat but unlike bogs, fens are fed by groundwater. The water in fens moves very slowly but is alkaline instead of acidic so it can support more life than bog water can. Grasses, **sedges** (grasslike vegetation that has three sides instead of two and thus cannot be rolled between the fingers), reeds, wildflowers, willow trees and birch trees, and shrubs are common in fens. (Note: Sedges are found in many types of wetlands and their presence should not be considered a definite indication of a fen habitat.)

OVERVIEW:

Students visit a local area and make observations about the area's hydrology, soils, and vegetation. They then use those observations to determine if the area is a wetland, what type of wetland it is, and approximately where the wetland boundaries are.

PROCEDURE:

Teacher Preparation:

1. Locate a wetland field site and arrange transportation to and from the site.

2. Locate the 3 augers, the soil logging tray, the 5 white trays, the 5 laminated soil color charts, and the 5 rulers in the module.

3. Make photocopies of the "Wetland Observations Data Sheet" for your students.

4. Procure clipboards for your students.

Student Experiment or Activity:

1. Upon arrival at the field site, on the way to the field site or in the classroom before departing for the field site, stimulate a discussion about wetlands, their definition, how to identify them, and the four main types of wetlands. Also cover the concept of assigning operational taxonomic units, i.e., assigning names to objects whose common or scientific names students don't know. For example, if students found a spiny, long plant, they might call it "Spiny Long Plant" for the purposes of this activity instead of using a field guide to determine the real common and/or scientific name. In this activity, operational taxonomic units allow students to distinguish among different types of vegetation and to get a sense of the biodiversity of a wetland without necessarily identifying the types of vegetation with a taxonomic key.

2. Divide students into five teams and distribute a data sheet and clipboard to each team or to each student

3. Have students work in their teams to complete the "Wetland Observations Data Sheet".
    - Distribute yardsticks to students when they get to #2 on the data sheet.
    - For #3 on the data sheet, remind students that they do not need to count all of the plants. They need only estimate the number of individuals of that type present at the site.
    - If necessary, briefly discuss the different types of distribution (even, clumped, random) in the fifth column of the table in #3 on the data sheet.
    - After students have completed the table in #3 on the data sheet, have them summarize their observations in b.) through f.) at the bottom of the second page of the data table.
    - Distribute an auger and a plastic tray to students when they get to #4 on the data sheet. Assign them to a specific area to take their soil samples. Be sure to assign teams to areas with and without standing water, saturated and dry locations, and at least one location you believe to be the uplands. Students should take two soil samples at the site: one for them to work with and one for you to put in the soil logging tray. Place this second sample in the corresponding slot (#1-5) in the soil logging tray and record the origin of the soil sample in the chart below. When students bring back their soil samples, have them exchange their auger for a ruler and a color chart.

Soil Logging Tray Slot #	**Collection location of soil sample**
1	
2	
3	
4	
5	

- Once all students have had the opportunity to complete the table in #4 on the data sheet, bring the entire group together and have them compare and contrast the five different soil samples. Without telling them which samples are from the uplands and which are from the wetlands, have students guess based on the color and other characteristics of the samples.
- For #6, remind students that they are to determine if the study area *in general* (not just their soil sample site) is a wetland or not.

DISCUSSION:

Discuss students' responses to questions 6-8 on the data sheet, being sure to have them support their responses with observations they made.

Is there any evidence that flooding affects the study area? If so, what is that evidence and how does it affect the study area? *Answers will vary but many wetlands remain "wet" because or periodic flooding. Wetlands also mitigate flood damage by absorbing and slowing down floodwaters.*

EVALUATION:

- Define "wetland," "hydric soil," "hydrophytic vegetation," "hydrology," and "anaerobic".
- List the three main conditions that are used to identify an area as a wetland.
- Describe and distinguish among the four major types of wetlands: marshes, swamps, bogs, and fens.

EXTENSIONS AND MODIFICATIONS:

- Focus only on the vegetation (question #3) or the soils (question #4) to reduce the duration of the activity.
- Photocopy and distribute the "Wetlands Summary" handout page for your students if you think they'll need help answering question #7a.
- Use the *Abridged National List of Plant Species that Occur in Wetlands* to determine the Wetland Indicator Status of the different types of vegetation in the area you are studying.
- Use the *Soil Survey of Crawford County Pennsylvania* (if your field site is in Crawford County) to determine if hydric soils are present in the area you are studying.
- Have students research local wetlands and its type, hydrology, soils, and vegetation.
- Invite a wetland expert to visit your class and/or lead your Wetlands Observations expedition.
- Collect soil samples in the field, preserve their moisture by storing them in Ziploc bags, and then have your students observe the samples in the classroom and try to determine if the soils are hydric or not.
- Bring along the aquatic plant books included in the module and have students identify common plants instead of assigning operational taxonomic units.
- Have students study a specific wetland plant and share their findings with the rest of the class.
- Have students create a 3-D wetland model from their diagram or from scratch.
- Use the blank Soil Color Chart and have students use Crayola crayons to make their own soil charts.

NOTES (PLEASE WRITE ANY SUGGESTIONS YOU HAVE FOR TEACHERS USING THIS ACTIVITY IN THE FUTURE):

DATA SHEET: WETLAND OBSERVATIONS

Name_____Date_____

Use your powers of observation to complete the following questions and tables.

1. Draw an overhead view of the area, indicating trees, shrubs, grasses, emergent vegetation, open water, standing water, waterways, etc. Label or make a key for your sketch.

2. Observe the hydrology, or presence of water, at the site.

Is standing water present? ❑Yes ❑No

If yes, ask your teacher for a yardstick and complete the following questions:

-is there standing everywhere? ❑Yes ❑No

-is the depth of the water ❑ uniform OR ❑ variable ?

-how deep is the standing water? _____ feet minimum

_____ feet maximum

3. Observe the vegetation at the site.
    a.) List the different types of vegetation in the table below. If you do not know the real name of the plant, simply make up an operational name for it that will help you identify it and distinguish it from other plants.

Plant Name	**Sketch of Plant**	**Plant Tissue:** Woody OR Non-Woody (**Star if sedge)	**Estimated Presence:** Dominant (**D**)=the most common type(s) or vegetation, Common (**C**)=numerous individuals present but not as many as the dominant types of plants, OR Rare (**R**)=very few present	**Distribution:** Even, Clumped, OR Random	**Plants of this type commonly found:** with other plants of the same species OR mixed with other plant species (specify which species)	**Typical Hydrology of plant location:** Standing Water, Saturated Soil, OR Upland	**Other Observations**

(More space on back of page if needed.)

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b.) Total types of vegetation _____

c.) Total types of woody plants _____ Approximate percentage of vegetation that is woody _____

d.) Total types of non-woody plants _____ Approximate percentage of vegetation that is non-woody _____

e.) Total types of sedges _____

f.) Is peat present? ❑Yes ❑No Is sphagnum moss present? ❑Yes ❑No

4. a.) Ask your teacher for an auger and a plastic tray. Also ask your teacher where you should take your soil samples.
   b.) Label this location on your diagram on page 1 and go to the assigned location. Use the auger to extract two 12-inch long soil samples.
   c.) Carefully and without disrupting the soil samples, place one sample in your plastic tray and bring the other sample to your teacher and remind him/her of where you got the sample. Then ask the teacher for a ruler and a color chart.
   d.) Use the ruler to measure 2 inches from the surface end of the soil sample.
   e.) Remove a small section of the sample from that depth and make observations to fill in the chart below.
   f.) Repeat e.) above for 4 inches, 6 inches, and 12 inches from the surface end of the soil sample, and the maximum depth of the soil sample. Be sure to measure and record exactly what the maximum depth is.

Depth from soil surface	**General observations/ patterns/ features/ insects**	**Color #** *(Use the color chart)*	**Soil Particles** (organic matter, sand, minerals, clay, silt, pebbles, etc.)	**Soil Moisture** (dry, moist, wet, very wet, dripping)	**Soil Texture** (crumbles, sticks together, sticks to fingers, clay-like, oozes)
2 inches					
4 inches					
6 inches					
12 inches					
Maximum depth= ____inches					

Soil numbers 1, 5, 6, 9, 10, 13, 14, 15, and 16 (and 2 sometimes) are typically wetland soils.

g.) Based on your observations above, would you describe your soil sample as hydric wetland soil? Why or why not?

_____
_____
_____

5. List the three main conditions that are used to identify an area as a wetland.
   a.) _____
   b.) _____
   c.) _____

6. Based on your answer to Question 5 and your observations above, would you describe this site as a wetland? Why or why not?
   _____
   _____
   _____
   _____

7. If you <u>would</u> describe this site as a wetland,
   a.) what specific type of wetland is it? A marsh, swamp, bog, fen other? Why?
   _____
   _____
   _____
   _____

   b.) what are the boundaries of the wetland? (upland and/or waterway) Label them on your diagram on page 1.
   _____
   _____

   c.) how can you tell where the wetland ends and the upland begins?
   _____
   _____
   _____
   _____

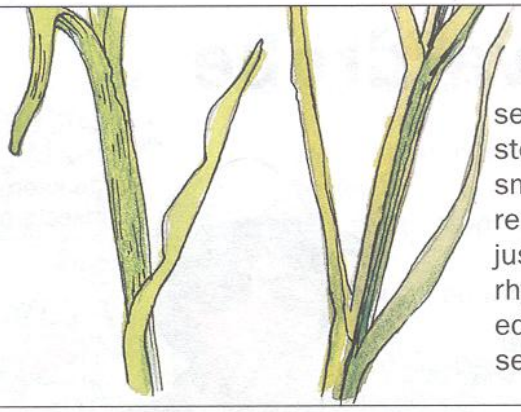
   d.) list any evidence that this wetland has been altered by humans or nature.
   _____
   _____
   _____

8. If you would <u>not</u> describe this site as a wetland, record any evidence that this area was once a wetland and has been disturbed by human activity or nature.
   _____
   _____
   _____
   _____

Wetlands Summary

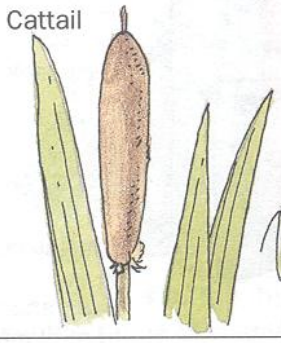
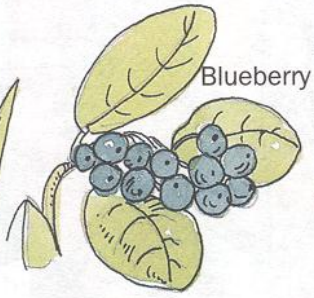
Grass or sedge?

Can you tell the difference between grasses and sedges? Here's an easy way to do it. Hold a stem between your thumb and forefinger and roll it around. You'll find that grass has a smooth, round stem and a



sedge has a three-sided stem that doesn't roll smoothly in your fingers. To remember the difference, just think of the simple rhyme, "sedges have edges." You'll find lots of sedges in a fen.

Wetland Summary

TYPE OF WETLAND	Marsh	Swamp	Bog	Fen
	 Cattail	 Blueberry	 Sphagnum Moss	 Pitcher-plant
Location	• along shores of rivers, streams and coasts, in shallows of ponds and lakes, or in potholes	• along rivers, streams and lakes	• in northern climates • often in deep depressions with no drainage	• in northern climates • usually in low-lying areas with some drainage
Plant life	• soft-stemmed emergents such as cattail and arrowhead	• mainly woody-stemmed plants such as shrubs and trees	• layers of peat • evergreen trees and shrubs • a surface carpet of sphagnum moss • insect-eating plants	• layers of peat • sedges, grasses and low shrubs • insect-eating plants
Water	• up to 2 m (7 feet) of water • small marshes may dry up in the summer	• shallow water that may dry up by the end of the summer	• stagnant and acidic water, sometimes covered with a floating mat of moss • open water may be very deep	• slow-moving, shallow surface water that may dry up during summer

Credits: Hickman, Pamela. Wetlands: Investigating Swamps, Fens, Bogs, and Marshes. Ontario: Kids Can Press, 1993.